

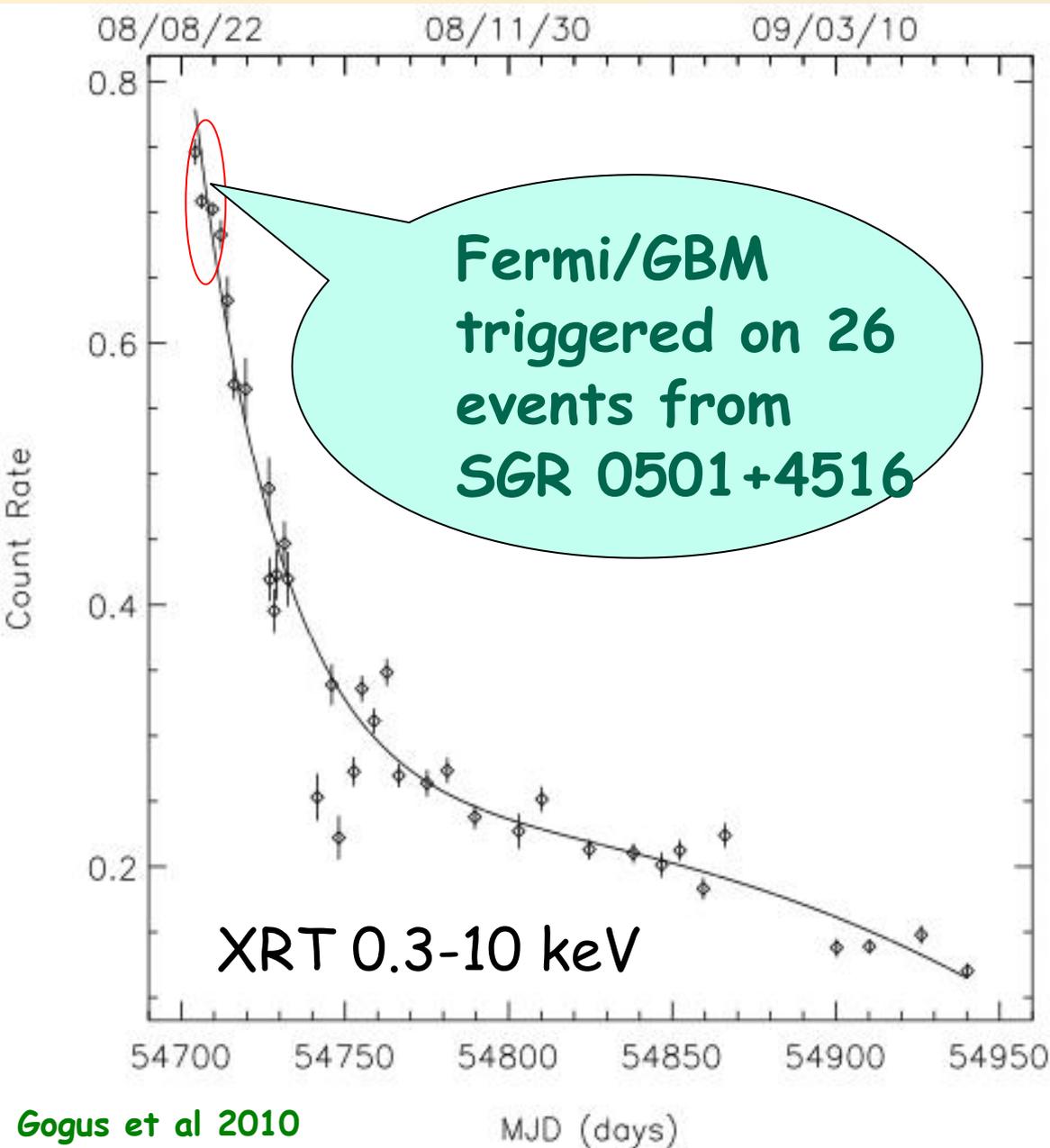
Fermi/GBM Observations of SGR J0501+4516

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On behalf of the GBM Magnetar team

SGR J0501+4516

Discovered 2008 August 22,
with *Swift*/BAT



RXTE ToO program
triggered ~4 hours after
the first Swift trigger for
600 s

A period was found and
reported ~ 9 hours after
the first Swift trigger!

$$P = 5.7620 \text{ s}$$

$$\dot{P} = 7.4980 \times 10^{-12}$$

$$B = 2.1 \times 10^{14} \text{ G}$$

$$RA. = 05h01m06.756s$$

$$Dec. = +45d16m33.92s$$

(0.1" error)

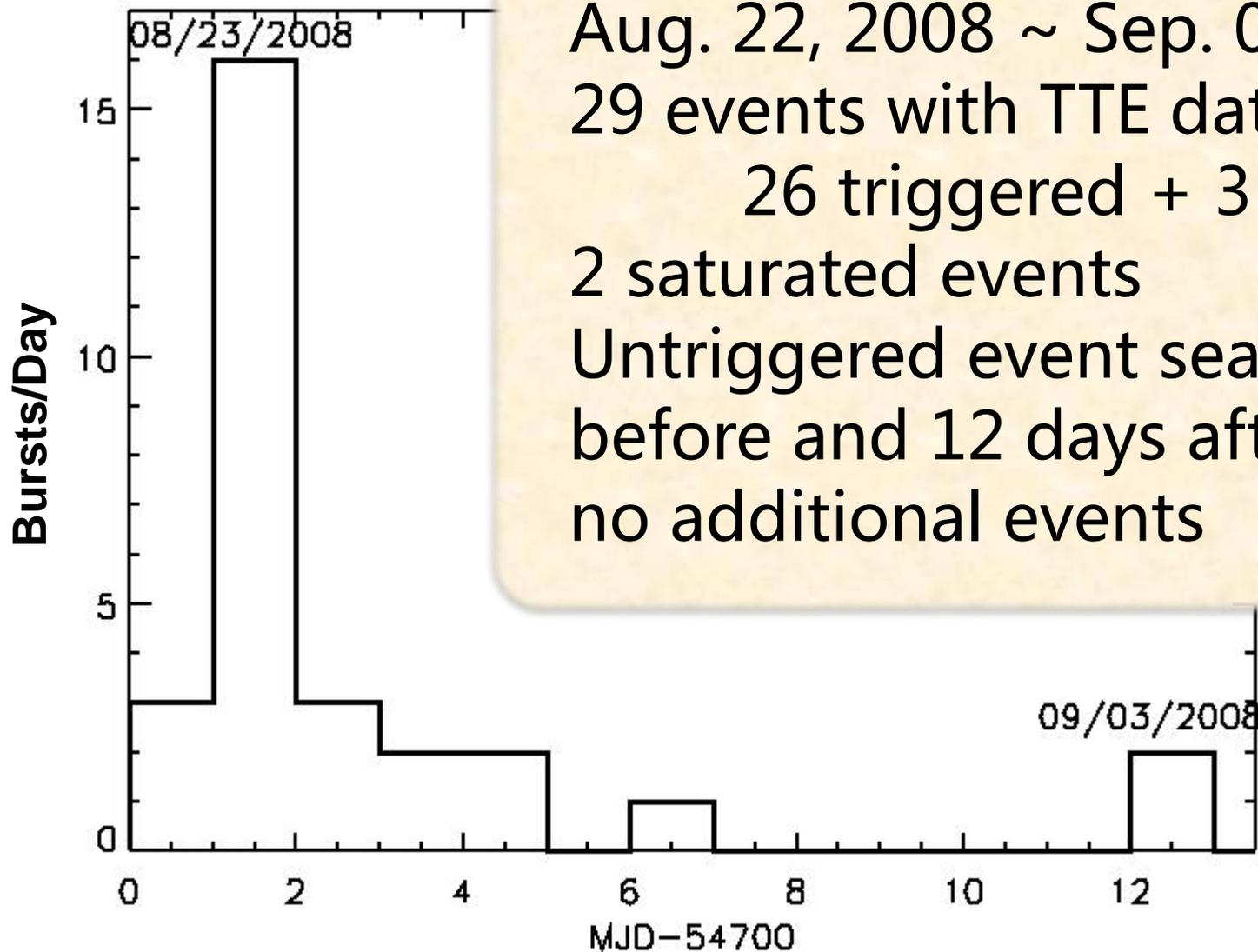
Earlier Activity of the source

- Two BATSE events on 1993 July 25
- Two BeppoSAX/GRBM events on 2000 Oct. 11

All four events had locations consistent with SGR J0501+4516 but with large error circles.

They also show similar temporal and spectral properties.

Fermi/GBM Observations



Aug. 22, 2008 ~ Sep. 03, 2008

29 events with TTE data =

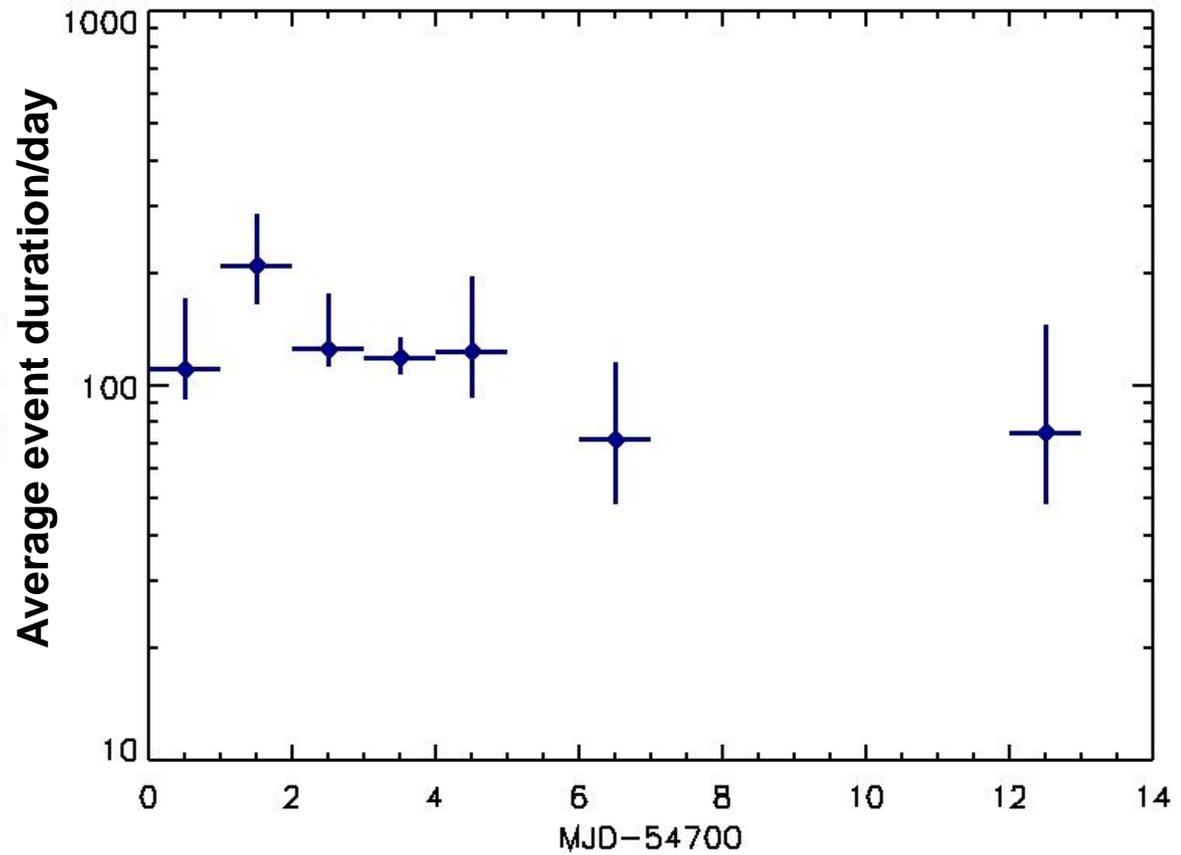
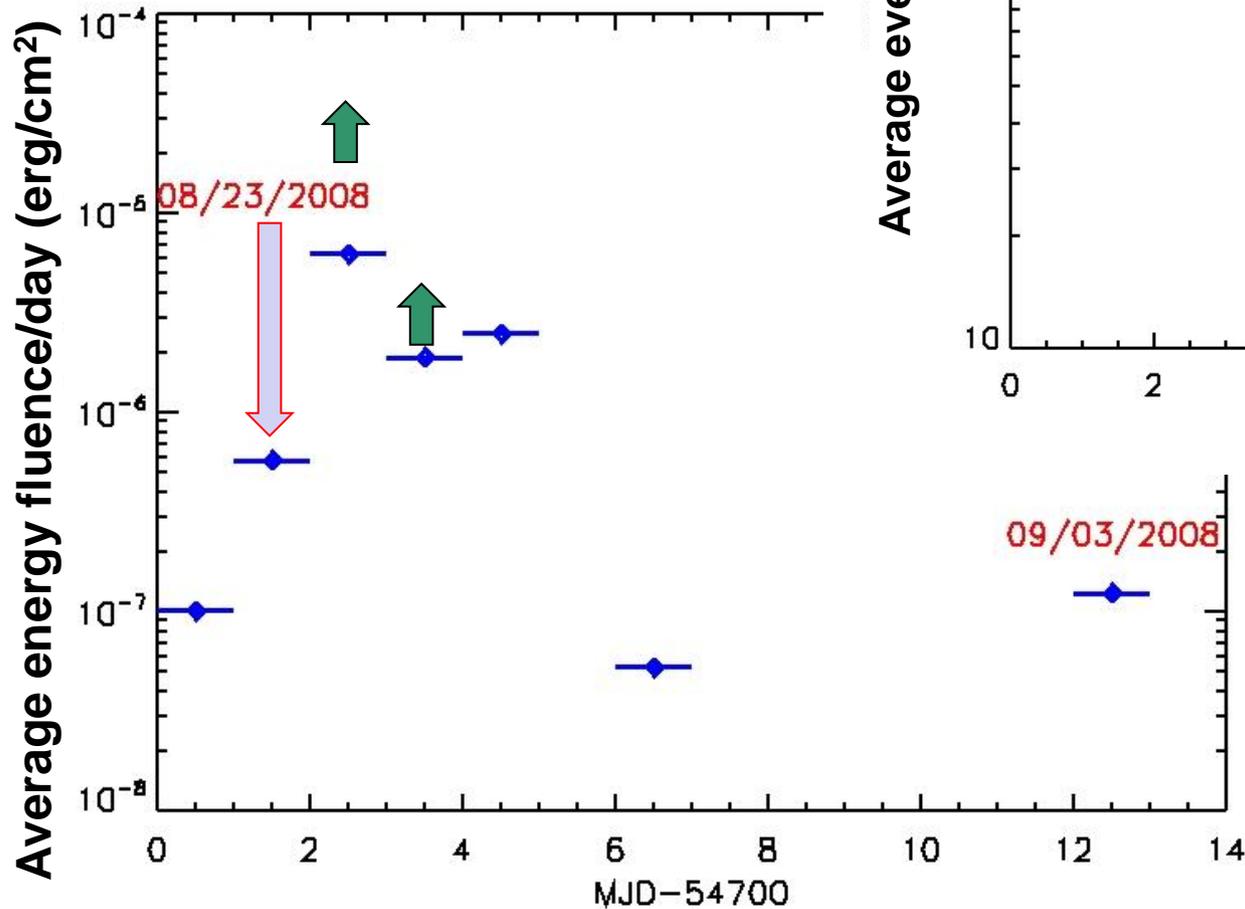
26 triggered + 3 untriggered

2 saturated events

Untriggered event search for 1 day before and 12 days after revealed no additional events

Spectral & Temporal Analyses Overview

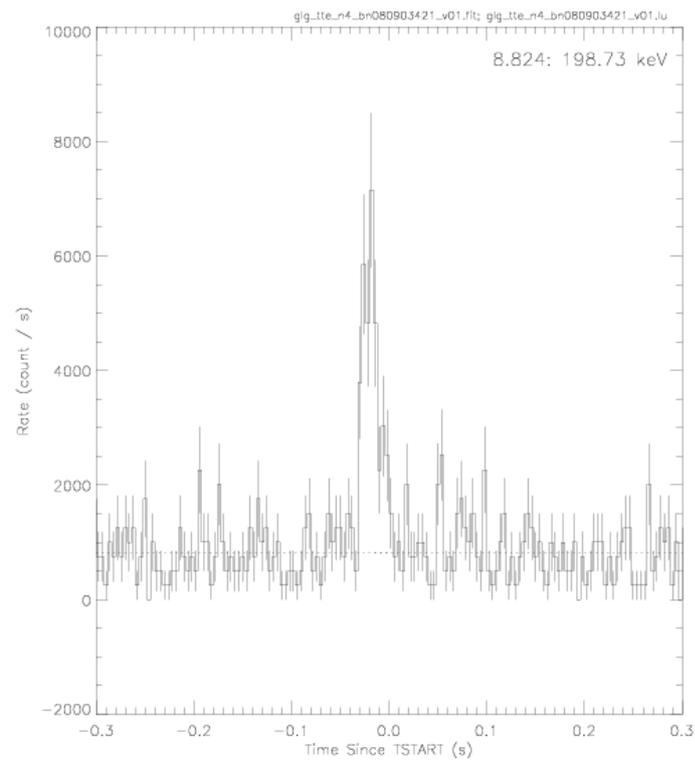
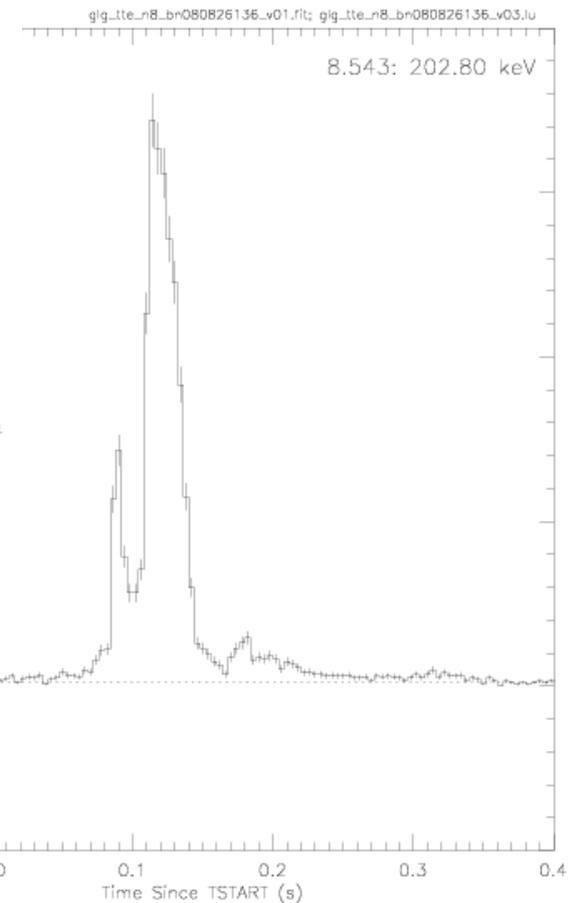
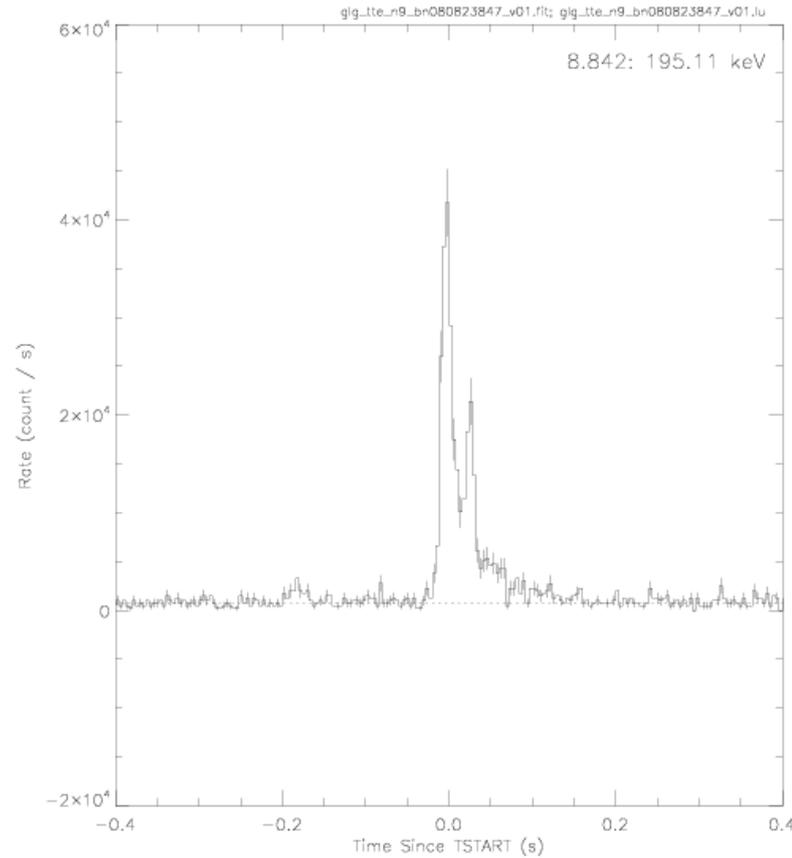
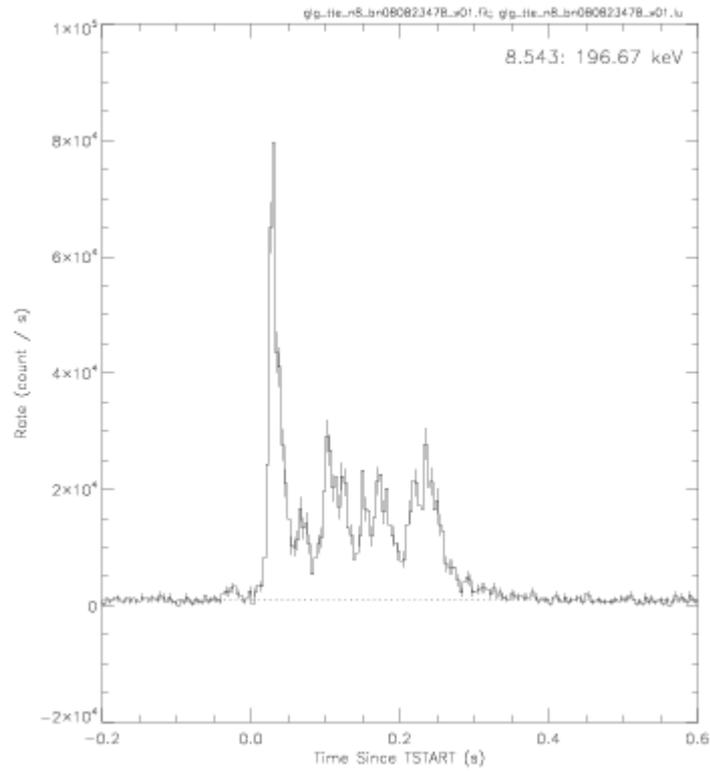
(Detectors with angle $< 50^\circ$ to the source and without blockage)



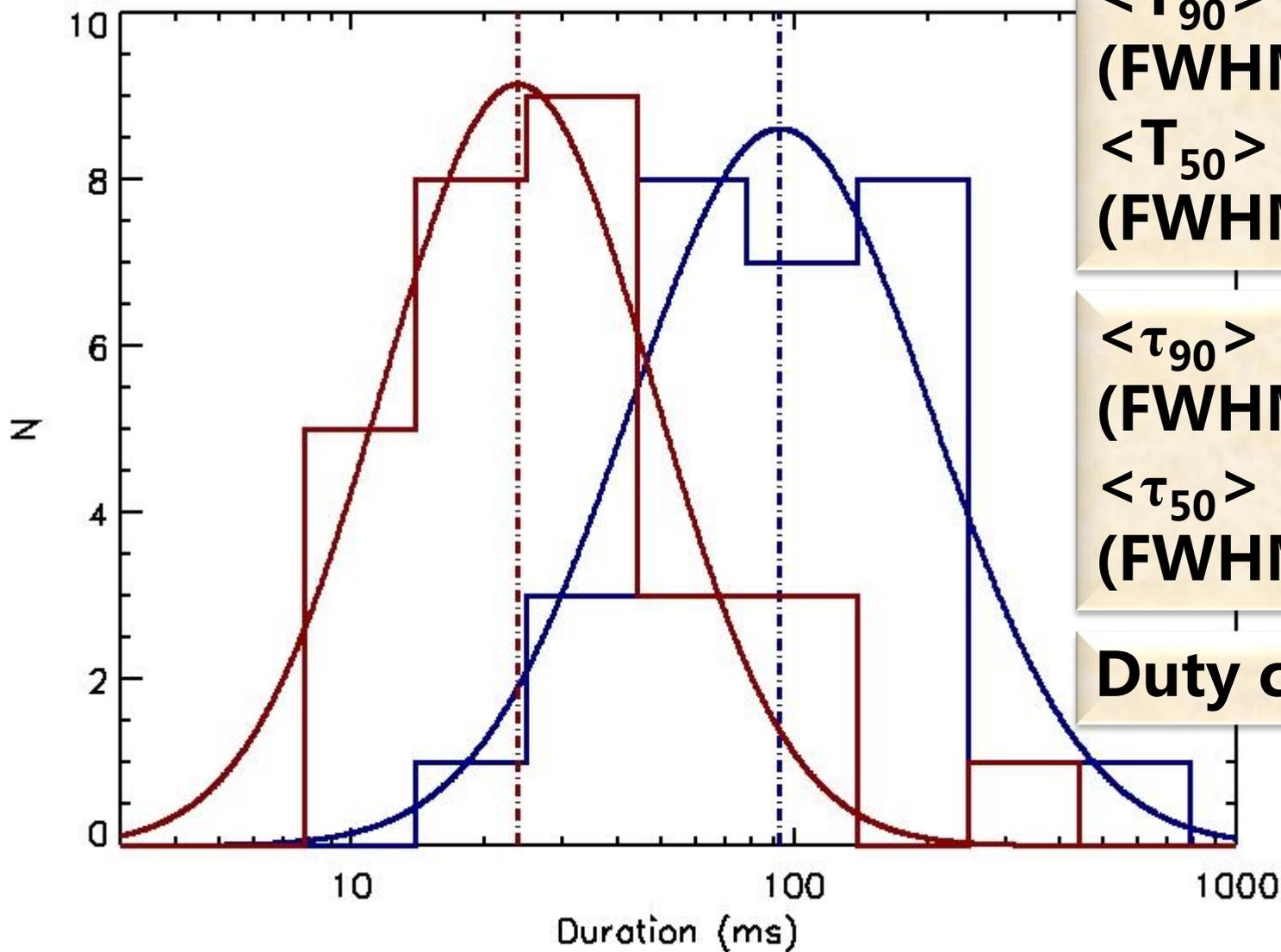
09/03/2008

12.5

Temporal Analysis



Duration Distribution

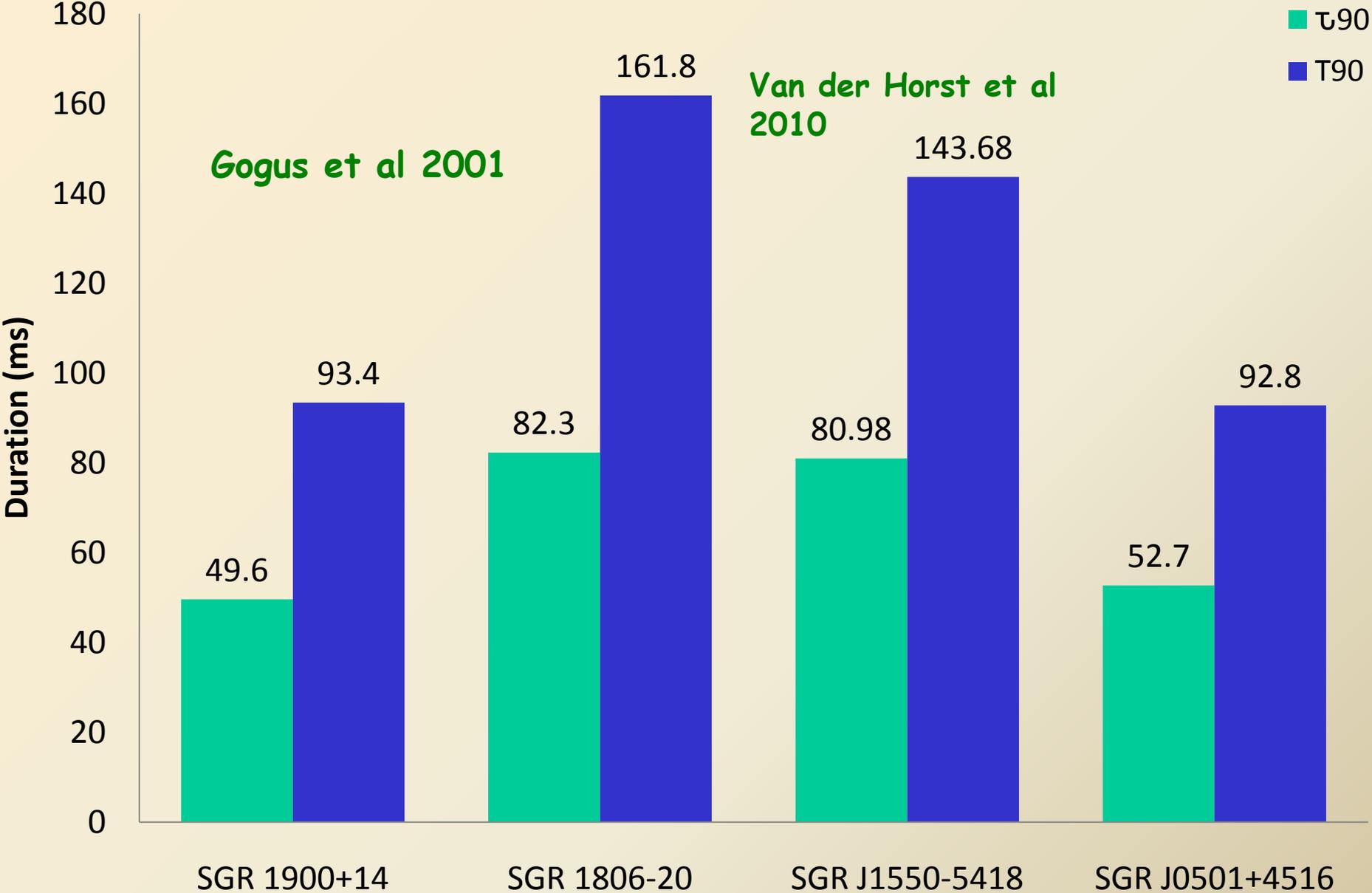


$\langle T_{90} \rangle \sim 93$ ms
(FWHM = 197 ms)
 $\langle T_{50} \rangle \sim 24$ ms
(FWHM = 21 ms)

$\langle \tau_{90} \rangle \sim 53$ ms
(FWHM = 132 ms)
 $\langle \tau_{50} \rangle \sim 17$ ms
(FWHM = 31 ms)

Duty cycle $\sim 68\%$

Duration Comparison



Time Integrated Spectral Analysis

- 8-200 keV, excluding K-edge 30-40 keV

- Over T_{90}

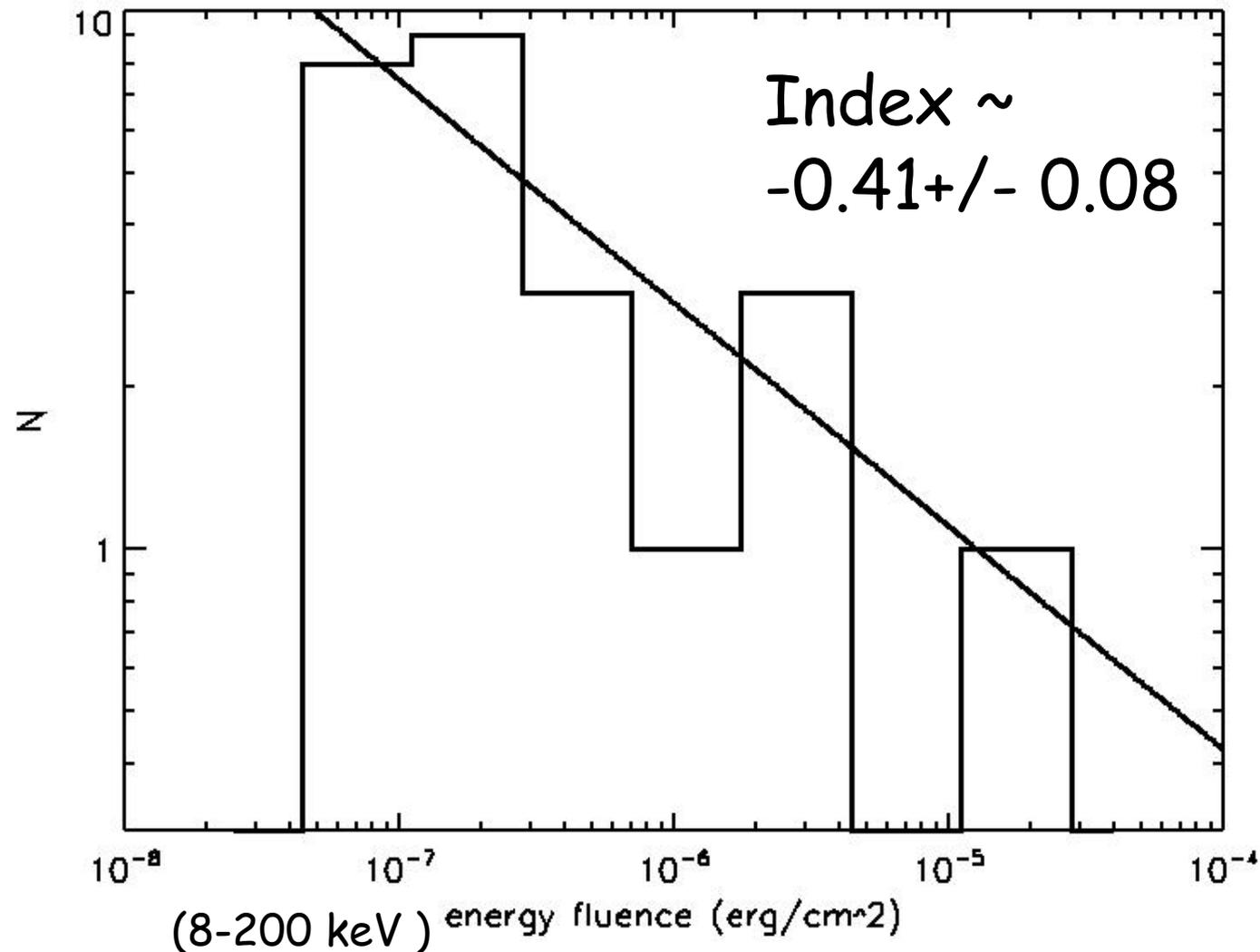
- OTTB

BB

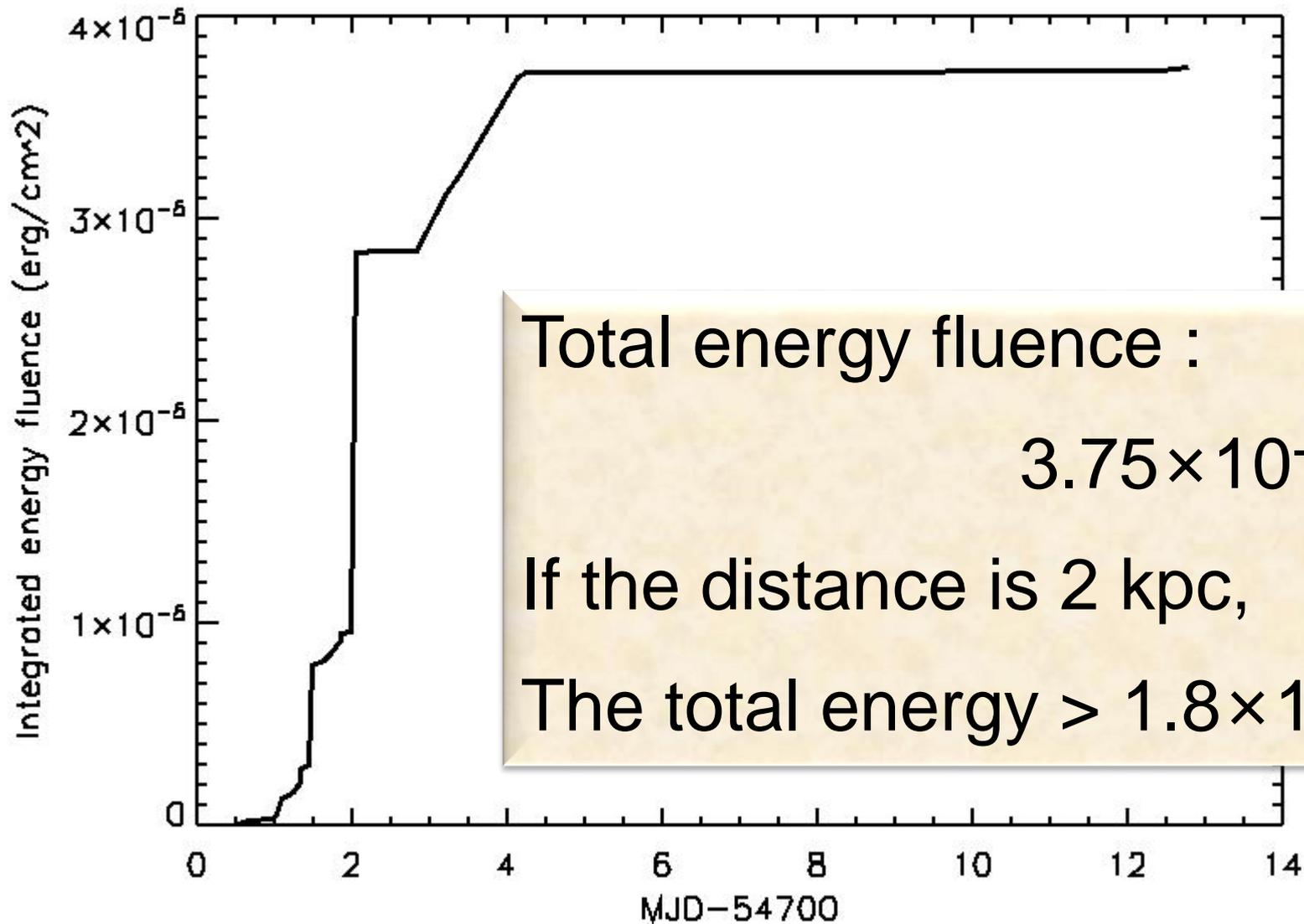
- ✓ COMPT

BB+BB

BB+PL



Energetic



Total energy fluence :

$$3.75 \times 10^{-5} \text{ erg/cm}^2$$

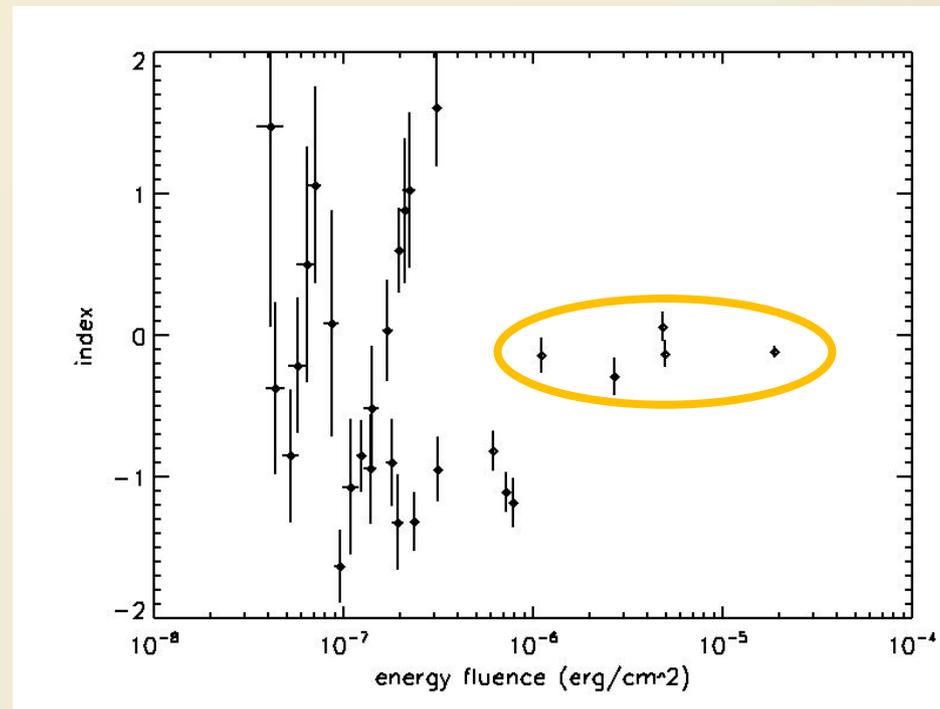
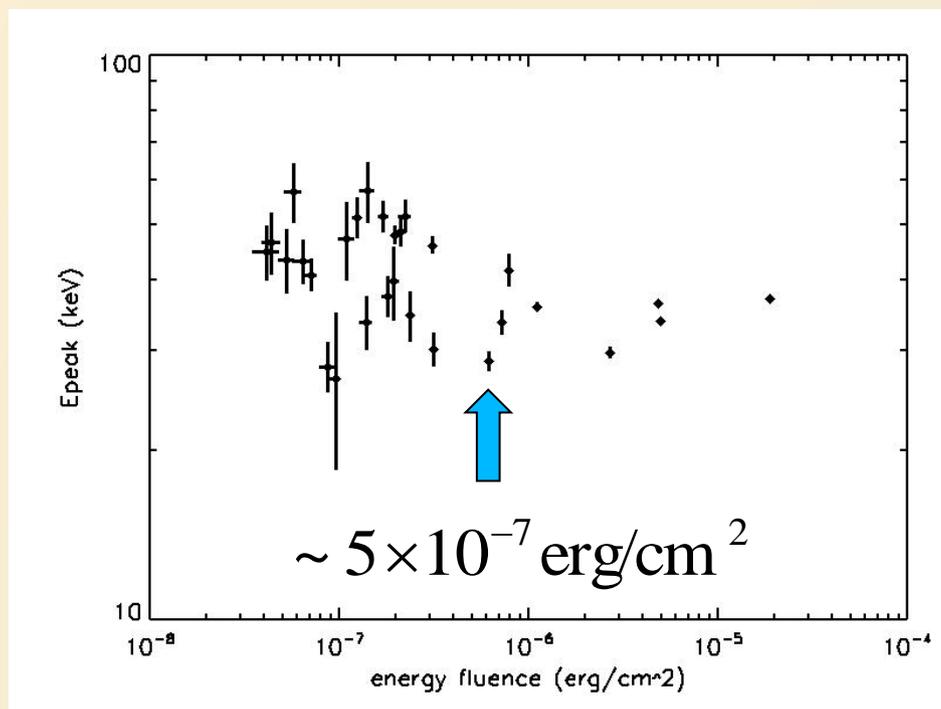
If the distance is 2 kpc,

The total energy $> 1.8 \times 10^{40}$ ergs

Correlations for the Compt model parameters

E_{peak} v.s. energy fluence

index v.s. energy fluence

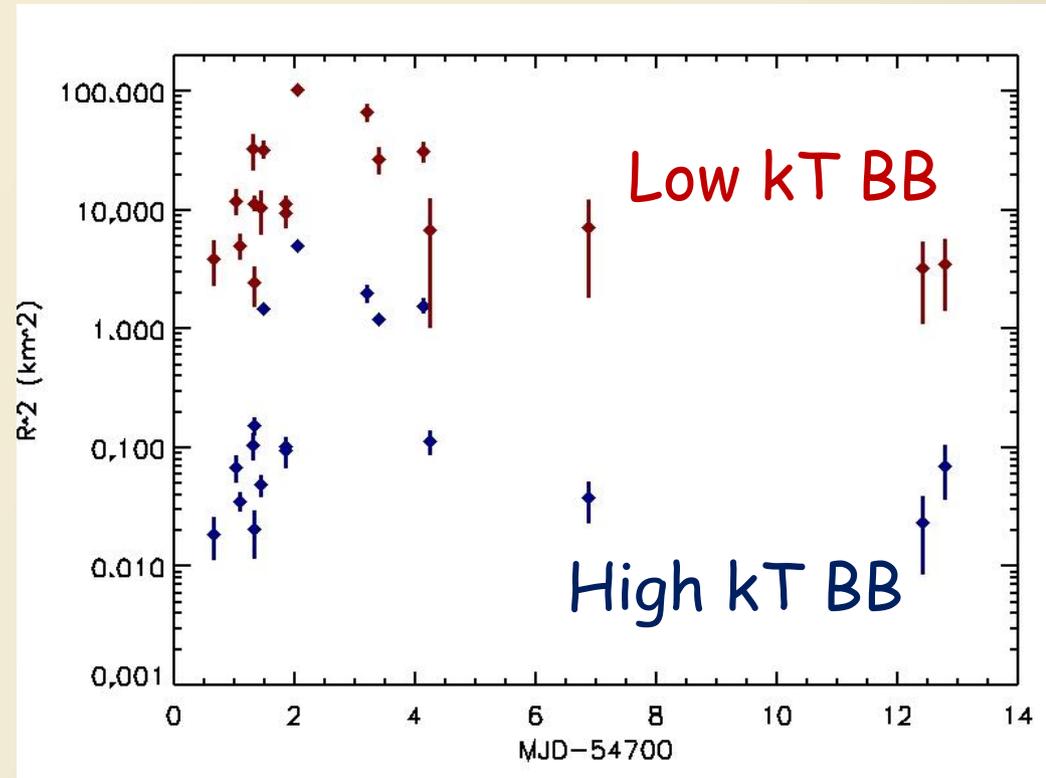
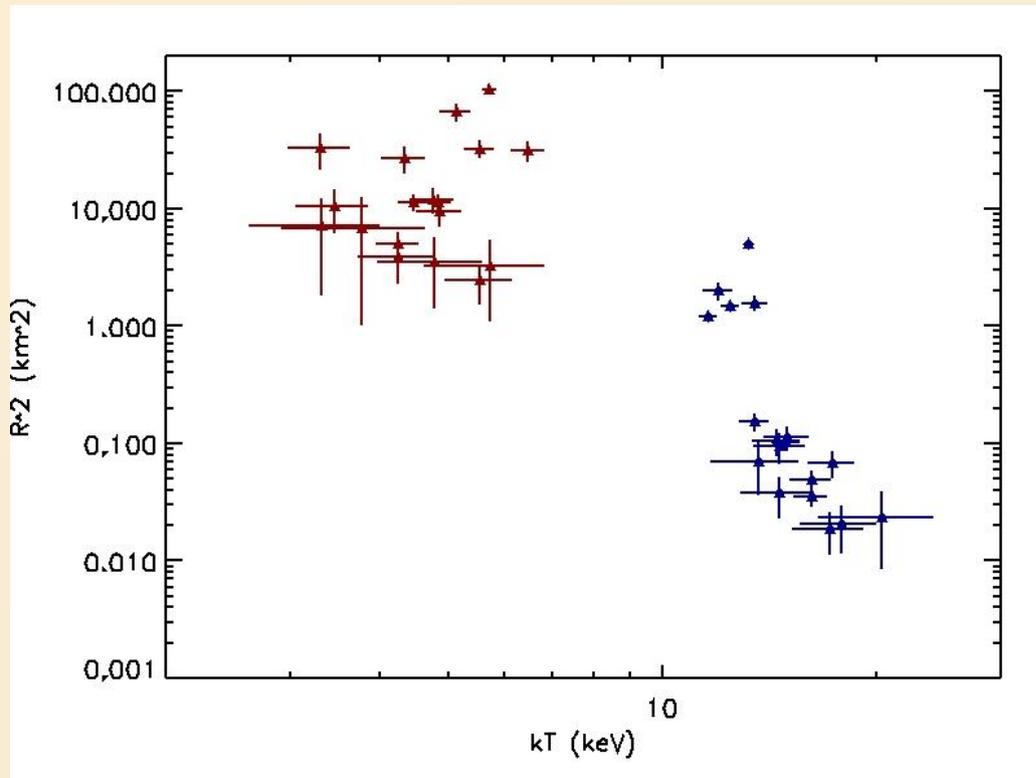


E_{peak} follows a Gaussian distribution with mean of 35.8 keV and $1\sigma=9$ keV

Index ~ 0 , for bursts with High energy fluence

Correlations for the BB+BB model parameters

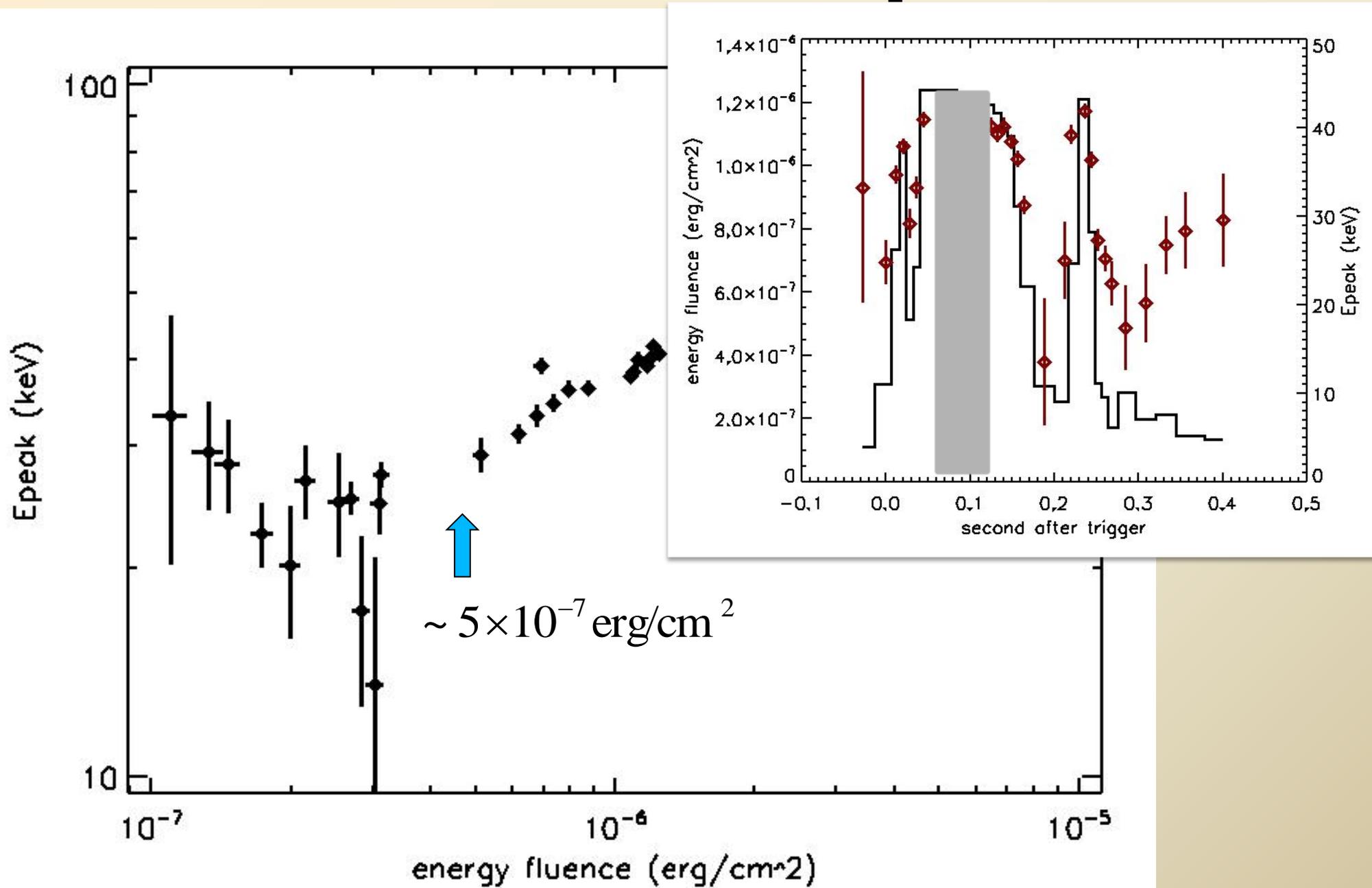
Emission area* v.s. kT Emission area* evolution



*Assuming a distance of 2 kpc

The surface area of a NS $\sim 100 \text{ km}^2$

Time resolved spectra



Summary

- 29 bursts observed by Fermi/GBM, most active during first 4 days
- Temporal properties are comparable to other SGRs, $\langle T_{90} \rangle \sim 93$ ms
- The Comptonized model fits the integrated spectra best. SGR J0501+4516 has a harder spectrum than SGR J1550-5418.
- E_{peak} follows different trends with fluence below and above a certain fluence level.
- SGR J0501+4516 could be undergoing outbursts every 7-8 years